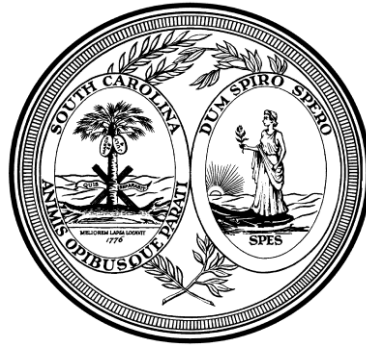# South Carolina
College- and Career-Ready
Standards for Mathematics

Support Document

3rd Grade

South Carolina College- and Career-Ready Standards for Mathematics
3rd Grade Mathematics Support Document

As support for implementing the *South Carolina College- and Career-Ready Standards for Mathematics*, the standards for each grade K-5 have been grouped into possible units. In the *Table of Contents* below, the titles for those possible units are listed in a column under each grade. To see which standards are addressed in each unit for this grade and to read a brief description of the focus for each unit in this grade, click on the *Overview of Units* in the [*Table of Contents*](#). The completed units for this grade are hyperlinked from/to the *Table of Contents* and the *Overview of Units*. The purpose of this document is to provide guidance as to how <u>all</u> the standards at this grade <u>may</u> be grouped into units and how those units might look. Since this document is merely guidance, districts should implement the standards in a manner that addresses the district curriculum and the needs of students.

Acknowledgments

"Jean Baptiste Massieu, famous deaf educator, made a statement that is now considered a French proverb. *Gratitude is the memory of the heart.* Indeed, appreciation comes when you feel grateful from the depths of your heart. The head keeps an account of all the benefits you received and gave. But the heart records the feelings of appreciation, humility, and generosity that one feels when someone showers you with kindness." It is with sincere appreciation that we humbly acknowledge the dedication, hard work and generosity of time provided by the following individuals who are making the K-5 Mathematics Support Document possible. (http://quotations.about.com/od/ThankYou/a/Gratitude-Quotes.htm)

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	Table of Contents for Grades K-5					
	K	**1st**	**2nd**	**3rd**	**4th**	**5th**
	Overview of Units	Overview of Units	Overview of Units	Overview of Units	Overview of Units	Overview of Units
Unit 1	Counting and Cardinality	Composing and Decomposing Numbers Through 10	Place Value Concepts	Conceptual Understanding of Multiplication & Division	Place Value, Addition, & Subtraction with Whole Numbers	Expressions, Equations, & the Coordinate Plane
Unit 2	Understanding Relationship of Counting and Quantity	Addition and Subtraction Strategies	Developing Concepts Addition/ Subtraction	Place Value	Algebraic Thinking	Place Value
Unit 3	Count and Compare	Understanding Place Value	Fluency and Word Problems Addition/ Subtraction	Addition & Subtraction	Multiplication & Division of Whole Numbers	Operations with Whole and Decimal Numbers
Unit 4	Composing and Decomposing Numbers	Applying Place Value Concepts	Developing an Understanding of Multiplication	Application of Multiplication & Division	Fraction Equivalence	Adding and Subtracting Fractions
Unit 5	Addition and Subtraction	Comparisons and Data	Attributes Polygons and Fractional Parts	Conceptual Understanding of Fractions	Adding, Subtracting, & Multiplying with Fractions	Multiplying with Fractions
Unit 6	Patterns and Positions	Geometry and Equal Shares	Measurement Length	Data Analysis	Decimal Concepts	Dividing with Fractions
Unit 7	Two Dimensional and Three Dimensional Geometry	Measurement, Time, and Money	Measurement Time and Money	Identification and Classification of Geometric Shapes	Conversions & Problem Solving with Measurement	Classifying 2D Shapes
Unit 8	Foundations of Measurement		Creating and Understanding Data	Problem Solving with Measurement	Geometric Classifications & Line Symmetry	Perimeter, Area, and Volume
Unit 9	Understanding Graphs and Data			Fluency with Multiplication & Division	Angle Measurement	Converting Measurements within a Single System

Grade Three Overview of Units

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Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9
Conceptual Understanding of Multiplication & Division	Place Value	Addition & Subtraction	Application of Multiplication & Division	Conceptual Understanding of Fractions	Data Analysis	Identification and Classification of Geometric Shapes	Problem Solving with Measurement	Fluency with Multiplication & Division
Standards	**Standards**	**Standards**	**Standards**	**Standards**	**Standards**	**Standards**	**Standards**	**Standards**
3.ATO.1 3.ATO.2 3.ATO.3 3.ATO.6	3.NSBT.1 3.NSBT.4 3.NSBT.5	3.NSBT.2 3.ATO.8 3.ATO.9	3.ATO.3 3.ATO.4 3.ATO.5 3.ATO.9	3.NSF.1 3.NSF.2 3.NSF.3 3.G.2	3.MDA.3 3.MDA.4	3.G.1 3.G.3 3.G.4	3.MDA.1 3.MDA.2 3.MDA.5 3.MDA.6 3.ATO.8	3.NSBT.3 3.ATO.7 3.ATO.8
Unit Focus	**Unit Focus**	**Unit Focus**	**Unit Focus**	**Unit Focus**	**Unit Focus**	**Unit Focus**	**Unit Focus**	**Unit Focus**
To develop conceptual understanding, students use concrete objects, drawings and symbols to represent multiplication and division facts and then solve real-world problems.	Students use place value understanding to read, write, round, compare, and order numbers.	Students develop fluency with addition and subtraction of whole numbers through 1,000, and apply these skills in real-world problems.	Building on conceptual understanding from Unit 1 and now with a focus on application, students continue working with multiplication and division facts in a variety of problem solving situations.	Students begin to build fraction sense, working with a variety of models to emphasize unit fractions and explore fraction equivalence.	Students extend their understanding of data analysis to include scaled picture and bar graphs, as well as line plots.	Students continue working with 2-D shapes, categorizing by attributes. Students also identify 3-D shapes based on given 2-D nets.	Students solve real-world problems involving a variety of measurement concepts.	Students apply a variety of strategies to demonstrate fluency and solve real-world problems with multiplication and division facts.

Conceptual Understanding of Multiplication and Division

Content Standards with Clarifying Notes

Open bullets indicate clarifying notes

- **3.ATO.1** Use concrete objects, drawings, and symbols to represent multiplication facts of two single-digit whole numbers and explain the relationship between the factors (i.e., 0-10) and the product.
  - Develop conceptual understanding which means using concrete/hands-on methods to explore multiplication
  - Develop vocabulary for the terms in a multiplication fact.
- **3.ATO.2** Use concrete objects, drawings and symbols to represent division without remainders and explain the relationship among the whole number quotient (i.e., 0 – 10), divisor (i.e., 0 – 10), and dividend.
  - Develop conceptual understanding which means using concrete/hands-on methods to explore division
  - Develop vocabulary for the terms in a division fact.
- **3.ATO.3** Solve real-world problems involving equal groups, area/array, and number line models using basic multiplication and related division facts. Represent the problem situation using an equation with a symbol for the unknown.
  - Develop conceptual understanding of how models and equations represent the problem situations.

New Academic Vocabulary for This Unit

- division
- divisor
- dividend
- quotient
- multiplication
- factor
- product

Prior Knowledge Required for this Unit

In 2nd grade, students used repeated addition to find the total number of objects arranged in rectangular arrays and wrote expressions to express the total as a sum of equal addends. (2.ATO.4) In this unit rectangular arrays are the basis for introduction to multiplication and division.

Subsequent Knowledge Related to this Unit

Students will use conceptual understanding of multiplication and division from this unit to determine unknown whole numbers in multiplication and division equations, to understand the relationship between multiplication and division, and to solve problems related to multiplication and division.

In Unit 4 students apply conceptual understanding of multiplication and division by using properties of operations and other strategies to solve problems and explain their reasoning. In Unit 8 students will use multiplication and division when solving problems with measurement. In Unit 9, students extend their understanding when multiplying a single digit number by a multiple of 10. By the end of 3rd grade, students are expected to demonstrate fluency with basic multiplication and division facts (3.ATO.7)

Relationship Among Standards in this Unit

Students develop conceptual understanding of what multiplication and division are, and explore the relationships between the two operations.

Potential Instructional Strategies/Lessons

Teacher Note:
- Students can more readily develop an understanding of multiplication concepts if they see visual representations of the computation process. For example, they can picture students in a marching band arranged in equal rows or chairs set up in rows in an auditorium. Using models can help students develop meaning for operations and lessen the abstraction of operations. Students can use various objects and materials to make models that will help them make sense of operations, including the following: movable objects such as counters, craft sticks, tiles, and containers to put them in; multi-cubes or other interlocking cubes; visual materials such as pictures; arrays (an arrangement of rows and columns); base ten blocks; money (pennies, nickels, dimes, quarters, dollars); grid paper; number lines; hundreds charts; and tape diagrams. Models and representations can be used to help students understand what the symbols in operations mean. Students need to work with representations that help them see the relationships between multiplication and repeated addition, and between multiplication and division.

Introducing Arrays (3.ATO.1, 3.ATO.2, 3.ATO.3)
https://www.engageny.org/resource/grade-3-mathematics-module-1-topic-lesson-1
(Download the Module 1 lesson, topic A.)
This lesson focuses on understanding equal groups as multiplication. The Look especially at the activity sheets. The emphasis there is on arrays as repeated addition which extends the 2nd grade introduction to arrays.

www.youtube.com/watch?v=DDoFS9CNFs0
This video is designed for teachers not students. The video demonstrates an introduction to multiplication with arrays, and provides suggestions as to how students might build models. Use the strategies introduced in the first 4 minutes 12 seconds of the video as background teacher information to introduce multiplication with arrays.

https://learnzillion.com/lesson_plans/141-farmer-john-s-seeds-relate-multiplication-and-division-to-the-array-model-using-equal-groups

(must set up a free account)

This student activity supports conceptual understanding of how to organize equal groups into an array and how multiplication and division can be represented with arrays.

Relationship Between Multiplication and Division (3.ATO.3)

http://blog.aimsedu.org/2013/10/01/addressing-mathematical-practice-standards-through-multiplication-and-division-word-problems/

This lesson addresses the relationship between multiplication and division through the use of real-life problems.

Resources

Operations with Rectangular Arrays (3.ATO.1, 3.ATO.2, 3.ATO.3)

http://www.softschools.com/counting/games/multiplication.jsp

game with visual models

www.youtube.com/watch?v=M_DQHbBKq00

basic introduction to multiplication with rectangular arrays

https://www.youtube.com/watch?v=UKlz2aWa_Mg

 math talk using arrays for multiplication

www.youtube.com/watch?v=c7UwNboK0I8

multiplication using an array

https://www.youtube.com/watch?v=yMrVFwupaGw

multiplication with arrays to find products and factors

www.emis.de/proceedings/PME28/RR/RR018_Outhred.pdf

research findings on student drawings of rectangular arrays

www.youtube.com/watch?v=erpHiUHk-3A

basic introduction to division with rectangular arrays

Operations with a Variety of Concrete Models (3.ATO.1, 3.ATO.2, 3.ATO.3)

Examples of Models

http://www.eworkshop.on.ca/edu/resources/guides/Guide_Math_K_6_Volume_5.pdf

A Guide to Effective Instruction in Mathematics, Kindergarten to Grade 6 - Volume 5, pp 28-29 (*Using Models to Represent Facts of Multiplication and Division*) gives examples of a variety of models to represent multiplication and division facts.

http://illuminations.nctm.org/Lesson.aspx?id=1251

Hoping on a Number Line - In this interactive lesson, students generate products using the number line model. This model highlights the measurement aspect of multiplication and is a distinctly different representation of the operation. The order (commutative) property of multiplication is also introduced. Students are encouraged to predict products and to answer puzzles involving multiplication.

www.sccoe.org/depts/ci/math/.../**Bar**%20**Diagrams**.do

 Using bar diagrams

Literature Connections

Count on Pablo, by Barbara deRubertis (1999)

Pablo and his grandmother prepare and sell vegetables at an outdoor market. The story provides an exploration of ×5 facts as Pablo and his grandmother sell onions tied in pairs (×2 facts), tomatoes in boxes of 10 (×10 facts), and peppers in bags of 5 (×5 facts). Pablo skip-counts to determine the number of vegetables being prepared for market, but through classroom explorations, the story allows for an easy transition from skip-counting to multiplication.

Amanda Bean's Amazing Dream by Cindy Neuschwander

This book makes a convincing case to children about why they should learn to multiply. The story helps children see what multiplication is, how it relates to the world around them, and how learning to multiply can help them. At the end of the story, the section titled "For Parents, Teachers, and Other Adults" explains what's important for children to learn about multiplication and suggests three activities to extend children's learning.

The Hershey's Milk Chocolate Multiplication Book by Jerry Pallotta

This book uses the arrays in a chocolate bar to teach multiplication.

Culminating Activity

https://learnzillion.com/lessons/2999-solve-word-problems-using-the-idea-of-equal-groups

sample explanation of multiplication

http://www.commoncoresheets.com/Interactive.php?Worksheet=Math/Interactive/3oa1

Go to Multiplication and Division links and select topics such as Creating Equations from Arrays, Rectangular Arrays, Writing Multiplication Equations, Rewriting Addition to Multiplication, Multiplying with Arrays, Dividing with Number Lines, and No Remainder. This site now has some interactive practice for use on the Promethean board.

Sample Formative Assessment Tasks/Questions

http://www.achieve.org/files/NYCDOEG3MathCookieDough_Final.SW_.pdf

- performance tasks

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3rd Grade Math Unit 2	Return to	

Place Value

Content Standards with Clarifying Notes

Open bullets indicate clarifying notes

- **3.NSBT.1** Use place value understanding to round whole numbers to the nearest 10 or 100.
  - Teacher Note: This is the first time students have been introduced to rounding.
- **3.NSBT.4** Read and write numbers through 999,999 in standard form and equations in expanded form.
- **3.NSBT.5** Compare and order numbers through 999,999 and represent the comparison using the symbols >, =, or <.

New Academic Vocabulary for This Unit

- rounding
- benchmark numbers
- order numbers (greatest to least and least to greatest)
- equation

Prior Knowledge Required for this Unit

In 2nd grade, students learned to read, write and represent numbers through 999 using concrete models, standard form, and equations in expanded form (2.NSBT.3), compared three digit numbers (2.NSBT.4), learned place value through 999 (2.NSBT.1), and added 10 or 100 more or less to a given number up to 1000 (2.NSBT.8). This is the students' first introduction to rounding.

Subsequent Knowledge Related to this Unit

In fourth grade, students will use rounding as one form of estimation and round whole numbers to any given place value.

Relationship Among Standards in this Unit

Understanding place value and having the ability to demonstrate that understanding are vital in the development of mathematical thinking. In this unit students will use place value concepts to round, read, write, order and compare numbers through 999,999.

Potential Instructional Strategies/Lessons

Rounding: 3.NSBT.1

Teacher Note:

In *Teaching Student-Centered Mathematics Grades 3-5 (2006)*, John Van de Walle explains that in our number system, some numbers are "nice" or easy to think about and work with. "What makes a number nice is sort of fuzzy. However, numbers such as 100, 500, and 750 are easier to use than 96, 517, and 762. Multiples of 100 are very nice, and multiples of 10 are not bad either... Flexible thought with numbers and many estimation skills are related to the ability to substitute a nice number for one that is not so nice. The substitution may be to make a mental computation easier, to compare it to a familiar reference, or simply to store the number in memory more easily. You might say, 'Last night it took me 57 minutes to do my homework' or 'Last night it took me about an hour to do my homework.' The first expression is more precise; the second substitutes a rounded number for better communication."

In the past, students were taught rules for rounding numbers. Unfortunately, the emphasis was placed on applying the rule correctly (If the next digit is 5 or greater, round up; otherwise, leave the number alone.) Knowing when rounding is appropriate/useful and understanding how the thinking process works are important in making rounding a skill students can and will use.

A common roadblock in rounding numbers is that students cannot identify the number that is halfway between two consecutive tens or hundreds (e.g., 35 is halfway between 30 and 40; 750 is halfway between 700 and 800.) A useful tool to address this concept is the number line.

A number line with nice numbers highlighted is the focus of the rounding strategies and activities in this unit.

Just Hanging A-Round

http://www.cpalms.org/Public/PreviewResourceLesson/Preview/46508

In this lesson, students will demonstrate knowledge of rounding in problem solving with or without the aid of a number line.

Reading and Writing Numbers: 3.NSBT.4

Teacher Note:

A common misconception in reading and writing larger numbers is that the student recognizes simple multi-digit numbers, such as 30 or 400, but does not understand that the position of a digit determines its value. The student mistakes the numeral 306 for thirty-six or writes 4008 when asked to record four hundred eight. Such errors are often due to a misunderstanding of zero's use as a place holder. Close monitoring of student responses is necessary to identify and correct place value misconceptions. Another common error is the use of "and" when reading whole numbers. A student might read 306 (three hundred six) as three hundred and six, or 2,478 (two thousand, four hundred seventy-eight) as two thousand, four hundred and seventy-eight. The word "and" is used when reading decimal or mixed numbers only.

Place Value to 999,999

http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=48&ved=0CEkQFjAHOChqFQoTCLfGpK7llMYCFQPQgAodqDwAyw&url=http%3A%2F%2Fwww.esc11.net%2Fcms%2Flib3%2FTX21000259%2FCentricity%2FDomain%2F91%2F10_M030101.pdf&ei=_mOAVbfPGoOggwSo-YDYDA&usg=AFQjCNEADGwh74Ql81Mu-Nd8B5OlOtQTLA&sig2=1_0SqWywlw_9DiYs5zuY5Q

- In this five-day unit, students use base-ten blocks and place value charts to describe place value in numbers up to 999,999. Standard form, expanded notation, word form, and the value of each digit are investigated. Blackline masters of all support materials are included.

Expanded Form

http://studyjams.scholastic.com/studyjams/jams/math/numbers/expanded-notation.htm

- changing numbers to and from expanded form.

Place Value to 100,000

http://www.toonuniversity.com/flash.asp?err=503&engine=15

- reading and writing numbers

Place Value and Expanded Form

http://mathlessons.about.com/od/fourthgradelessons/a/Lesson-Plan-Expanded-Notation.htm

- variety of practice

Number Boards

http://www.primaryresources.co.uk/online/numberboard2.swf

http://www.ictgames.com/arrowcards.html

- Both of these websites provide visuals to show place value and expanded form for given numbers

Order and Compare Numbers: 3.NSBT.5

http://www.eduplace.com/math/mw/background/3/01/te_3_01_place_ideas.html

- unit on ordering greater numbers, including place value concepts

http://www.teach-nology.com/teachers/lesson_plans/math/35orderingnum.html

- group activity to order large numbers

http://www.crickweb.co.uk/ks2numeracy-calculation.html
- ordering numbers to 10,000s

http://www.learnnc.org/lp/pages/2961?style=print
- small group activity for comparing numbers

https://www.pinterest.com/pin/268034615296174514/
- visual of whole class activity

Resources

EngageNY Grade 3 Module 2: Place Value and Problem Solving with Units of Measure
Lesson plans, activities, assessment, and resources for place value (you will need to select the ones that address the standards).
https://www.engageny.org/resource/grade-3-mathematics-module-2

Learn Zillion - **Round Whole Numbers to the Nearest 10 or 100**
https://learnzillion.com/lessonsets/370-round-whole-numbers-to-the-nearest-10-or-100
- 3 LearnZillion lessons (similar to powerpoint) to help students round numbers

https://wordpress.com/2013/11/17/tricks-are-not-for-kids/
- Strategy for rounding using a number line vs teaching tricks

Rounding Games
http://www.mathnook.com/math/skill/roundinggames.php

Teachers Pay Teachers Freebies - Center Games
https://www.teacherspayteachers.com/Product/Rounding-With-a-Number-Line-155326
https://www.teacherspayteachers.com/Product/Place-Value-737311

Guess My Number

This activity allows practice with place value skills in a game-like challenge. Can be adapted to any level of learning or ability.

http://www.mathsolutions.com/documents/0-941355-75-6_L3.pdf

Literature Connections

Coyotes All Around by Stuart J. Murphy
- Clever Coyote thinks it's time for lunch — and also time to show her friends how, with some simple rounding, she can add up numbers in her head. The story is also filled with lots of coyote factoids. Suggested classroom activities are listed at the end of the book.
- http://reckoningnreading.weebly.com/lesson-plans-pre-made.html
    This lesson plan to from Tarleton State University supports *Coyotes All Around* and is written for 3rd Grade.   An added plus, the handouts are included at the end of the document.

Sir Cumference and All the King's Tens by Cindy Neuschwander
- Understanding how numbers move in value from one place to the other is foundational for all other mathematical operations. *Sir Cumference and All the King's Tens* helps students to visualize the value of each digit in the place value chart. Visitors to the Royal Palace are grouped by tens and then by hundreds and ultimately by thousands. The illustrations and storyline help students to create a picture of how grouping numbers by ten easily lends itself to counting large numbers and combining them in other mathematical operations.

A Place for Zero: A Math Adventure by Angeline Sparagna Lopresti
- Zero is all alone in the land of Digitaria. He can't play addemup with the other numbers, because he has nothing to add. Join Zero as he goes on a journey to discover his place. His quest takes him from the mysterious workshop of Count infinity to the palace of King Multiplus, where Zero meets a stranger who looks surprisingly familiar.

How Much is a Million? by David Schwartz
- A popular book for teaching very large numbers, filled with examples that kids will relate to. Schwartz uses a series of examples to demonstrate how big a million is, then a billion, then a trillion.

Sample Formative Assessment Tasks/Questions
Rounding to the Nearest Ten and Hundred https://www.illustrativemathematics.org/content-standards/3/NBT/A/1/tasks/1805   https://grade3commoncoremath.wikispaces.hcpss.org/Assessing+3.NBT.1 (assessing for 3.NSBT.1)   Return to Table of Contents

Addition and Subtraction

Content Standards with Clarifying Notes

Open bullets indicate clarifying notes.

- 3.NSBT.2 Add and subtract whole numbers fluently to 1,000 using knowledge of place value and properties of operations.
  - ○ Emphasize using place value in communicating strategies (e.g., In 63 - 21, use "60 minus 20" or "6 tens minus 2 tens", not "6 minus 2.").
  - ○ Continue using multiple strategies including the concepts of properties of operations. For example, use the Commutative Property as a strategy to add 42 + 56 by changing the order of the addends to 56 + 42, or use the Associative Property to add 15 + 32 + 68 by grouping two of the addends as in 15 + (32 + 68). The Commutative Property is not a function of subtraction. The Associative Property could be used to subtract as in 25 - 12. (25 - 10) -2 or 25 - (10 - 2). The emphasis is on using the properties as a number sense strategy rather than learning the formal names of the properties.
- 3. ATO.8 Solve two-step real-world problems using addition, subtraction, *multiplication and division of whole numbers and having whole number answers.* Represent these problems using equations with a letter for the unknown quantity.
  - ○ Multiplication and division are addressed in future units (units 4, 8, and 9).
- 3. ATO.9 Identify a rule for an arithmetic pattern (e.g., patterns in the addition table *or multiplication table*).
  - ○ The word "term" refers to the independent elements in an expression, equation, or pattern. (Example: 6 + x has 2 terms; 6 + x = 14 has 3 terms)

New Academic Vocabulary for This Unit

- addend
- equation

- sum
- unknown
- thousands places

- difference
- hundreds place
- term*

Prior Knowledge Required for this Unit
In second grade, students added and subtracted fluently through 99 using knowledge of place value and properties of operations (2.NSBT.5) and solved one- and two-step real-world/story problems through 99 with unknowns in all positions (2.ATO.1). They added and subtracted through 999 using concrete models, drawings, and symbols which convey strategies connected to place value understanding (2.NSBT.7).   In first grade, students used pictures and words to create, extend, and explain repeating and growing patterns (1.ATO.9).
Subsequent Knowledge Related to this Unit
Third grade students will apply these skills later in the year in Unit 6 (Data Analysis) and Unit 8 (Problem Solving with Measurement). In fourth grade, students will recognize math periods and number patterns within each period to read and write in standard form large numbers through 999,999,999 (4.NSBT.2). Students will also use a standard algorithm as a strategy to fluently add and subtract multi-digit numbers (4.NSBT.4).
Relationship Among Standards in this Unit
Students apply conceptual understanding in a variety of ways to add and subtract numbers to 1,000.
Potential Instructional Strategies/Lessons

Balancing the Rigor of Mathematics

Conceptual Understanding	**Procedural Understanding**	**Application**
• Understand place value concepts • Understand a variety of computation strategies for adding and subtracting within 1,000 • Understand the commutative property, associative property of addition, and identity property of zero • Understand the inverse relationship between addition and subtraction • Understand that addition and subtraction problems can be written vertically and horizontally	• Use multiple strategies to add and subtract within 1,000.	• Solve real-world problems or use problem solving tasks that involve adding and subtracting within 1,000 • Apply known strategies to solve addition and subtraction problems sums larger than 1,000 • Decide if an answer is reasonable using mental math, estimation or rounding

Chart from: https://hcpss.instructure.com/courses/97/pages/3-dot-nbt-dot-2-about-the-math-learning-targets-and-rigor

Resources

https://www.khanacademy.org/math/arithmetic/addition-subtraction/sub_borrowing/v/basic-regrouping-or-borrowing-when-subtracting-three-digit-numbers

This Khan Academy demonstration models in expanded form to use place value understanding to subtract with regrouping.

https://learnzillion.com/resources/72274-use-models-and-drawing-strategies-to-add-and-subtract-within-1000-2-nbt-b-7

These lessons demonstrate adding and subtracting 3-digit numbers using base ten blocks, number lines, expanded form, decomposing, and composing.

https://www.illustrativemathematics.org/content-standards/tasks/953

The purpose of this task is to study some patterns in a small addition table. Each pattern identified persists for a larger table and if more time is available for this activity students should be encouraged to explore these patterns in larger tables. This task is intended for instructional purposes. The goal is to study the structure of the table and relate this to properties of addition.

http://illuminations.nctm.org/Lesson.aspx?id=503

A game encourages students to find the sums of two one-digit numbers. Students explore commutativity and examine patterns on an addition table. They then use a personal addition chart to record and keep track of known facts.

https://learnzillion.com/lesson_plans/5460-identify-patterns-on-an-addition-chart#fndtn-lesson

This lesson provides students with an opportunity to learn and use **addition patterns** to find sums

https://www.teachervision.com/addition/lesson-plan/2977.html

This lesson provides students with an opportunity to learn and use addition patterns to find sums.
- Students use basic addition facts and place-value patterns to add greater numbers.
- Students understand and use the Order Property of Addition and the Zero Property of Addition.

http://www.onlinemathlearning.com/addition-patterns.html

Videos, stories and songs to help Grade 3 students learn about **addition patterns** over increasing place values .

https://www.youtube.com/watch?v=-Di9X6TEblk

Students identify number patterns.

https://www.ixl.com/math/grade-3/add-two-numbers-up-to-three-digits

students practice addition of two 3-digit numbers.

http://www.mathplayground.com/tb_addition/thinking_blocks_addition_subtraction.html

On this MathPlayground.com activity, students use Thinking Blocks (tape diagrams) to model and then solve one and two-step word problems.

http://www.mathplayground.com/GrandSlamMath1.html

Grand Slam Math - 15 addition and subtraction word problems in a baseball game format

https://www.matific.com/us/en-us/grades/3G

(Free teacher account required)

Online lessons, games, and worksheets. Can set up a class and have students log in to practice/play.

Literature Connections

Mall Mania, by Stuart Murphy and Rene Andrian (2006)

The Parkside Mall is holding a "Mall Mania" day, and to celebrate, the 100th person to enter the mall will win a large pizza. It's the job of a group of friends to add up shoppers as they enter one of the four doors of the mall. Throughout the day, they share their numbers, with each update using a range of addition strategies.

329th Friend, by Marjorie Weinman Sharmat (1979)

Bored with his own company, Emery Raccoon invites 328 guests to lunch but finds that none of them has time to listen to him.

The King's Chessboard. by D. Birch (1993)

This book demonstrates the number pattern of exponential growth. A wise old man requests grains of rice according to the number of squares on a chessboard.

The Toothpaste Millionaire, by John Merrill (2006)

Sixth-grader Rufus Mayflower doesn't set out to become a millionaire. He just wants to save on toothpaste. Betting he can make a gallon of his own for the same price as one tube from the store, Rufus develops a step-by-step production plan with help from his good friend Kate McKinstrey. This story contains many real-world mathematical problems the characters must solve to succeed in their business.

Sample Formative Assessment Tasks/Questions

Assessments from hcpss for 3.NSBT.2: https://hcpss.instructure.com/courses/97/pages/3-dot-nbt-dot-2-assessment-tasks

http://www.bing.com/search?q=using+properties+to+add+and+subtract&qs=AS&pq=using+properties+to+add&sk=AS1&sc=3-23&sp=2&cvid=DAB39A6B47FD48AEBF62B60AD7BD2D08&first=57&FORM=PORE

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Application of Multiplication and Division

Content Standards with Clarifying Notes

Open bullets indicate clarifying notes.

- 3.ATO.3 Solve real-world problems involving equal groups, area/array, and number line models using basic multiplication and related division facts. Represent the problem situation using an equation with a symbol for the unknown.
- 3.ATO.4 Determine the unknown whole number in a multiplication or division equation relating three whole numbers when the unknown is a missing factor, product, dividend, divisor, or quotient.
- 3.ATO.5 Apply properties of operations (i.e., Commutative Property of Multiplication, Associative Property of Multiplication, Distributive Property) as strategies to multiply and divide and explain the reasoning.
- 3.ATO.9 Identify a rule for an arithmetic pattern (e.g., patterns in the addition table or multiplication table).

New Academic Vocabulary for This Unit

- symbol
- factor
- product
- dividend
- divisor
- quotient

Prior Knowledge Required for this Unit

In second grade, students used arrays to show repeated addition. That lays a foundation for the arrays and area models students will use in 3rd grade as they begin to develop an understanding of multiplication (2.ATO.4). Multiplication and division were introduced in previous third grade units (Unit 1 – Conceptual Understanding of Multiplication and Division) and the students solved real-world problems using basic multiplication and division facts.

Subsequent Knowledge Related to this Unit

In later third grade units, students will apply a variety of strategies to demonstrate fluency with multiplication facts. In fourth and fifth grades, they will use a variety of strategies to efficiently solve multi-digit multiplication and division problems.

Relationship Among Standards in this Unit
This unit is about helping students develop operation sense with respect to multiplication and division; that is, helping students connect different meanings of multiplication and division to each other as well as to addition and subtraction so that they can effectively use these operations in real-world settings.

Potential Instructional Strategies/Lessons
Teacher Note: In order to develop meanings for operations, students must solve contextual problems (story problems). However, there is more for teachers to think about than simply giving students word problems to solve. Problems should be based on students' real life experiences and be complex enough to build on the work from previous units (especially Unit 1: Conceptual Understanding of Multiplication and Division). Students are more likely to exhibit more meaningful approaches when solving contextual problems if they have connections to them. Students should use words, pictures, models, and numbers to explain how they solve problems and why they think their answers are correct. A complete lesson might address only one or two well-chosen problems because the emphasis should be on the relationship between different problem structures and solution approaches, not just on the solution. To emphasize the relationship between different problem structures and approaches, students should be given time to approach solutions in a manner meaningful to them and then share/compare solution strategies. As students are working on solution strategies the teacher should move about the room, probing student thinking and initially calling on students who have correct and varied approaches. That technique ensures students will hear correct thinking during sharing and can serve as the basis upon which teachers can later engage in conversation with struggling students.

Resources

https://www.youtube.com/watch?v=JDz0xO-ADHU
    Using models to solve multi-step real life problems. (3.ATO.3)
 	
https://www.ixl.com/math/grade-3/multi-step-word-problems
    Practice solving multi-step word problems (3.ATO.3)
 	
http://www.lakeshorelearning.com/general_content/free_resources/teachers_corner/lessonplan.jsp?lessonplan= multistepWordProblems
    Lesson on teaching multi-step problems (3.ATO.3)

Identifying and explaining arithmetic patterns using properties of operations (3.ATO.5 and 3.ATO.9)

Literature Connections

Six Dinner Sid (2004)
by Inga Moore
Sid is a cat who is addicted to having six meals a day and glories in this lifestyle. Manipulative, persuasive and a charmer, Sid has wrapped everybody around his little paw - each owner believes that Sid belongs to him only . . . until the day he is found out!

A collection of books to promote using multiple strategies to solve problems.
The Best of Times: Math Strategies That Multiply (2002)
The Grapes of Math (2004)
MATH-terpieces: The Art of Problem-Solving (2003)
by Greg Tang

The Best of Times takes on the times tables, teaching innovative ways to multiply numbers using patterns and derive answers WITHOUT memorization.
The Grapes of Math uses rhymes and riddles to solve problems.
In *MATH-terpieces*, Tang continues to challenge kids with his innovative approach to math, and uses art history to expand his vision for creative problem solving.

Culminating Activities:
https://www.engageny.org/resource/grade-3-mathematics-module-1
The lessons in this Module 1 demonstrate the commutativity of multiplication, and practice related facts by skip-counting objects in array models; find related multiplication facts by adding and subtracting equal groups in array models; model the distributive property with arrays to decompose units as a strategy to multiply; and model division as the unknown factor in multiplication using arrays and tape diagrams.
In Topic C, Lessons 7 and 8 introduce the new complexity of manipulating arrays to study the commutative property. Students learn to distinguish rows from columns as they rotate arrays 90 degrees, noticing that the meaning of the factors changes depending on the orientation of the array. Students write two different multiplication sentences to interpret the same array. These lessons emphasize the equivalence of facts by demonstrating, for example, that 2 groups of 8 and 8 groups of 2 have the same product. Students observe the pattern and begin to recognize commutativity as a strategy for solving twice as many facts.

Lessons 9 and 10 introduce the distributive property as a strategy for multiplication. In Lesson 9, students use arrays to decompose unknown facts as the sum or difference of two known facts. For example, they analyze an array to see that 7 × 3 can be decomposed as 2 rows of 3 + 5 rows of 3. In Lesson 10, students learn to write the decomposition as (5 × 3) + (2 × 3) = 21. They explain each step of the solving process.

In Topic D, students solve two types of division situations—partitive (group size unknown) and measurement (number of groups unknown)—using factors of 2 and 3. Students build on their background knowledge of tape diagrams and apply it to represent division. In Lesson 11, the tape diagram is used as a tool to help students recognize and distinguish between types of division. By the end of Lessons 11 and 12, students independently draw and label tape diagrams that help them to compare and analyze problems that may use the same division sentence but have quotients representing different things.

Lesson 13 solidifies growing understanding that the unknown can also be found from the related multiplication sentence. Students initially work through word problems using arrays and tape diagrams to practice solving the two types of division, and then transition to problem solving using abstract division and multiplication equations.

Sample Formative Assessment Tasks/Questions

www.achieve.org/files/NYCDOEG3MathCookieDough_Final.SW_.pdf

This unit includes a performance task with rubric, scoring guide, and sample annotated student work on 4 levels. It also contains initial and formative assessments as well as other instructional supports.

https://grade3commoncoremath.wikispaces.hcpss.org/Assessing+3.OA.3 (Assessing 3.ATO.3)

contains 5 collaborative tasks and summative assessment for determining when to multiply and divide in word problems. and how to represent multiplication and division word problems using drawings, and equations with unknowns in all positions.

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Conceptual Understanding of Fractions

Content Standards with Clarifying Notes

Open bullets indicate clarifying notes.

- 3.NSF.1   Develop an understanding of fractions (i.e., denominators 2, 3, 4, 6, 8, 10) as numbers.
  a.   a fraction (called a unit fraction) is the quantity formed by one part when a whole is partitioned into equal parts;
  b.   a fraction is the quantity formed by parts of equal size;
  c.   a fraction is a number that can be represented on a number line based on counts of a unit fraction;
  d.   a fraction can be represented using set, area, and linear models.
- 3.NSF.2   Explain fraction equivalence (i.e., denominators 2, 3, 4, 6, 8, 10) by demonstrating an understanding that:
  a.   two fractions are equal if they are the same size, based on the same whole, or at the same point on a number line;
  b.   fraction equivalence can be represented using set, area, and linear models;
  c.   whole numbers can be written as fractions (e.g., $4 = \frac{4}{1}$ and $1 = \frac{4}{4}$);
  d,   fractions with the same numerator or same denominator can be compared by reasoning about their size based on the same whole.
- 3.NSF.3   Develop an understanding of mixed numbers (i.e., denominators 2, 3, 4, 6, 8, 10) as iterations of unit fractions on a number line.
- 3.G.2   Partition two-dimensional shapes into 2, 3, 4, 6, or 8 parts with equal areas and express the area of each part using the same unit fraction. Recognize that equal parts of identical wholes need not have the same shape.

New Academic Vocabulary for This Unit

- unit fraction
- set model
- area model
- linear model

- numerator
- denominator
- whole number
- mixed number

- fraction equivalence
- partition (verb)

Prior Knowledge Required for this Unit

In second grade, students partitioned squares, rectangles, and circles into two or four equal parts and described the parts using the words *halves*, *fourths*, *a half of*, and *a fourth of*. They understand that when partitioning these shapes, the parts become smaller as the number of parts increases. (2.G.3)

Subsequent Knowledge Related to this Unit

In fourth grade, students will recognize, generate and explain equivalent fractions, and compare fractions. They will develop an understanding of addition and subtraction of fractions based on unit fractions and multiply a whole number and a fraction. Students will begin work with decimal numbers. (4.NSF.1-7)

In fifth grade, students will develop an understanding of adding and subtracting fractions with unlike denominators, and work with multiplication and division to solve problems involving fractions. (5.NSF.1-8)

Relationship Among Standards in this Unit

This unit focuses on the conceptual development of fraction concepts based on unit fractions. It is important to give students ample opportunities to develop fraction number sense. Throughout the unit, understanding develops with a variety of models, including area, linear, and set models.

Potential Instructional Strategies/Lessons

Teacher Note: Fractions are one of the most important topics students need to understand in order to be successful in algebra and beyond. Therefore, it is absolutely critical that we teach fractions well, present fractions as interesting and important, and commit to helping students understand the big ideas. Fraction understanding is developmental in nature. and experiences begin in second grade. In grade 3, fractions are a major emphasis, with attention to using fraction symbols, exploring unit fractions (fractions with numerator 1), and comparing fractions.

Clarke and colleagues (2008) and Cramer and Whitney (2010), researchers of fraction teaching and learning, offer research-based recommendations that provide an effective summary of this unit:
1. Give a greater emphasis to number sense and the meaning of fractions, rather than rote procedures for manipulating them.
2. Provide a variety of models and contexts to represent fractions.
3. Emphasize that fractions are numbers, making extensive use of number lines in representing fractions.
4. Spend whatever time is needed for students to understand equivalences (concretely and symbolically), including flexible naming of fractions.
5. Link fractions to key benchmarks and encourage estimation.

Fraction Progression from Illustrative Mathematics
https://www.illustrativemathematics.org/progressions
Fractions Progression Module consisting of videos paired with illustrative tasks to help teachers better understand the development of concepts and skills around fractions from grades 3-5.

Understand a fraction 1/b as the quantity formed by 1 part when a whole is partitioned into b equal parts.

https://learnzillion.com/resources/72250-understand-fractions

Nine lessons to support this standard (3.NSF.1)

The Meaning of Unit Fractions

https://www.illustrativemathematics.org/progressions

Fraction Progression and Resources from Achieve the Core (3.NSF.1)

Introduction to Fractions

Marilyn Burns' Fraction Kit- This pdf includes the directions on pages 1 and 2 for making construction paper fraction pieces for students to use throughout your fraction unit. Additional games (Cover Up and Uncover) are more suitable for 4th and 5th graders.

Understanding Fractions

http://www.k-5mathteachingresources.com/

Work station activities and support materials, including
Congruent Eighths
Equal Parts on the Geoboard
Exploring Fraction Kits
Finding Fractions of a Group
Find one half of a group
Fraction Barrier Game
Fraction Barrier Game Grid
Fraction Posters
Fractions with Color Tiles
Geoboard fourths

Resources

Culminating Activities

https://www.engageny.org/resource/grade-3-mathematics-module-5

*Engage New York's Grade 3 Mathematics Module 5: Fractio*ns as Numbers on the Number Line is a 35-day Grade 3 module, Students extend and deepen second grade practice with "equal shares" to understanding fractions as equal partitions of a whole. Their knowledge becomes more formal as they work with area models and the number line.

Fraction Equivalency Lessons, Practice, and Assessment

http://www.learningfarm.com

Students can work independently to review, practice, and assess understanding of fraction equivalency (3.NSF.2)
Requires membership after a 30-day free trial. Teacher can sign up for free trial for the whole class.

Literature Connections

Full House: An Invitation to Fractions

by Dayle Ann Dodds

At the end of a busy day of arriving guests, the Strawberry Inn is full to capacity, much to the delight of Miss Bloom, the hostess. Late that night, Miss Bloom is surprised to discover that all of her guests are downstairs, eating dessert! This is a great book for fraction lessons, as readers can reason along with the inn-keeper and the guests as they divide up their tasty midnight treat.

Gator Pie

by Louise Mathews

A group of alligators attempt to split a pie so that everyone gets a piece. A PowerPoint of this sometimes hard to find book is found at:

http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0CCUQFjABahUKEwi7krPdl4fJAhVGRiYKHXQnDHQ&url=http%3A%2F%2Falgebraicmathgrant.wikispaces.com%2Ffile%2Fview%2FGator%2520Pie%2520-%2520Nadine%2520Bazuk.ppt&usg=AFQjCNH-ZA2-k7JSSsgkVdzwh9uIqnq0lw&sig2=6cPrWjt315A7c7db_vp2Ww

The Hershey's Milk Chocolate Fractions Book

by Jerry Pallotta

Hershey's bars are made up of 12 rectangles, making it a natural fit for learning fractions. Each spread has different amounts of chocolate rectangles and the corresponding fractions (shown as 'three-fourths' and '3/4').

Sample Formative Assessment Tasks/Questions

https://www.engageny.org/resource/grade-3-mathematics-module-5

Mid-Module and End-of-Module task assessments

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3rd Grade Math Unit 6		

Data Analysis

Content Standards with Clarifying Notes

Open bullets indicate clarifying notes.

3.MDA.3   Collect, organize, classify, and interpret data with multiple categories and draw a scaled picture graph and a scaled bar graph to represent the data.

3.MDA.4   Generate data by measuring length to the nearest inch, half-inch and quarter-inch and organize the data in a line plot using a horizontal scale marked off in appropriate units.

New Academic Vocabulary for This Unit

- data
- scaled
- collect
- organize
- half-inch
- Quarter inch
- classify
- interpret
- line plot
- key
- unit

Prior Knowledge Required for this Unit

In grade one, students collected, organized, and represented data with up to 3 categories, using object graphs, picture graphs, t-charts, and tallies (1.MDA.4). They drew conclusions from object graphs, picture graphs, t-charts, tallies, and bar graphs (1.MDA.5). Students used nonstandard physical models to show the length of an object as the number of same size units of length with no gaps or overlaps, and ordered three objects using indirect comparison (1.MDA.2).

In grade two, students used appropriate tools to measure the length of an object and compared equal lengths using different units (2.MDA.1). They estimated and measured lengths in whole inches, feet, yards, centimeters, and meters (2.MDA.3). Students collected, organized, and represented data with up to 4 categories using picture graphs and bar graphs with a single-unit scale (2.MDA.9)

In Unit 5 of this Support Document, students developed an understanding of mixed numbers as iterations of unit fractions on a number line (3.NSF.3).

Subsequent Knowledge Related to This Unit

In 4th grade, students will convert measurements of length within a single system (in., ft., yd., or cm, m) and solve real-world problems involving length. They will create and interpret line plots to display data sets generated by measuring length to the nearest quarter-inch and eighth-inch.
In fifth grade, students will extend conversions of length to also include millimeters and kilometers.

Relationship Among Standards in This Unit

The standards in this unit focus on data collection, organization, classification, and interpretation.

Potential Instructional Strategies/Lessons

Teacher Note:
Data are gathered and organized in order to answer questions about our world. Data collection should be used for a purpose and information should be relevant and interesting to the students. Avoid gathering data simply to make a graph. In third grade, students work with scaled picture and bar graphs. Opportunities arise in other subject areas as well as in everyday activities to collect, organize, classify, and interpret data.

- collect: identify problem, develop question, identify audience, ask questions and document answers
- organize: combine data
- classify: decide how to group data based on different attributes
- create: select and construct the graph that most clearly represents the data, choosing the scale; drawing with precision, remembering that the issues of analysis and communication are more important than details and precision; label title and both axes ; use of technology is an effective way to emphasize the message and information rather than the graph construction Using grid paper may be helpful in constructing the graph. When constructing a bar graph, remember that bars may not touch each other; space must be left between the bars.
- interpret: discuss general shape of data (e.g., difference between highest and lowest), use graph to state facts and make inferences

The goal is for students to understand that a graph helps answer a question and provides a picture of the data. Students should talk and write about their graphs, explaining what the graphs tell them about the data and stating the answer to the original question.

Generating and Displaying Measurement Data

https://learnzillion.com/resources/72524-draw-scaled-picture-and-bar-graphs-3-md-b-3
- 5 lessons and an assessment task on drawing scaled picture and bar graphs (3.MDA.3)

https://learnzillion.com/resources/72234-generate-and-display-measurement-data-using-rulers-marked-with-halves-and-fourths-of-an-inch-3-md-b-4
- 5 lessons and a performance task (3.MDA.4)

Resources

https://www.youtube.com/watch?v=sATzD34VoEY
- Review of constructing a line plot using whole numbers (3.MDA.4)

https://www.ixl.com/math/grade-3/measure-using-an-inch-ruler
- practice for 3.MDA.4

Culminating Activity:

https://**www.engageny.org**/.../attachments/**math**-**g3**-m5-**full-module**.**pdf**
- Module of activities related to 3.MDA.4. Work focuses on understanding fractions as equal partitions of a whole. Student knowledge becomes more formal as they work with area models and the number line. Seven topics and assessments are included.

Literature Connections:

Martha Blah Blah by Susan Meddaugh

Something's wrong with Martha, the talking dog! She has eaten her daily bowl of alphabet soup, but when she opens her mouth to speak, strange sounds come out instead of words. Fortunately her nose still works, and she follows it to the source of the mystery.

http://mathsolutions.com/wp-content/uploads/978-0-941355-83-4_L1.pdf
- After reading the book, students work in pairs to collect, represent, and analyze data.

Lemonade for Sale by Stuart J Murphy

A group of children decide to fundraise to repair their clubhouse by setting up a lemonade stall. Keep track of their sales over a week using a bar graph.

Sample Formative Assessment Tasks/Questions

www.mrmaffesoli.com/printables/4MD4-MWL.pdf

Printables for plotting and analyzing line plots with fractions (3.MDA.4)

www.insidemathematics.org/assets/common-core.../parking%20cars.pdf

Performance task on scaled bar and picture graphs (3.MDA.3)

www.formativedifferentiated.com/uploads/3/1/3/.../pa_katie_revised.pdf

Performance task on 3.MDA.3

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Identification and Classification of Geometric Shapes

Content Standards with Clarifying Notes

Open bullets indicate clarifying notes.

- 3.G.1   Understand that shapes in different categories (e.g., rhombus, rectangle, square, and other 4-sided shapes) may share attributes (e.g., 4-sided figures) and the shared attributes can define a larger category (e.g., quadrilateral). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.
  - Students do not use the terms parallel or perpendicular in third grade.
- 3.G.3   Use a right angle as a benchmark to identify and sketch acute and obtuse angles.
- 3.G.4   Identify a three-dimensional shape (i.e., right rectangular prism, right triangular prism, pyramid) based on a given two-dimensional net and explain the relationship between the shape and the net.
  - "Net" is defined as a two-dimensional pattern of a three-dimensional figure. The net can be folded to form the figure.

New Academic Vocabulary for This Unit

- category
- right angle
- acute angle
- obtuse angle
- vertex (vertices)
- pyramid
- net

Prior Knowledge Required for This Unit

In second grade, students identified triangles, quadrilaterals, hexagons, and cubes. They recognized and drew shapes having specific attributes, such as a given number of angles or a given number of equal faces.

Subsequent Knowledge Related to This Unit

All though angles were introduced in 3rd grade as the basis for identifying and drawing shapes, the concept of angle is dealt with formally in 4th grade. Students are required to measure and draw angles in whole number degrees, solve addition and subtraction problems to find unknown angles and to understand the relationship of angle measurement to a circle. To understand angles, 4th grade students should draw points, lines, line segments, rays, parallel and perpendicular lines and identify those in 2-D figures. They will expand the 3rd grade quadrilateral classifications to now identify parallelograms and trapezoids based on the presence and/or absence of parallel and perpendicular lines. They also include right triangles as a

category. Students will also work with line symmetry.

Relationship Among Standards in This Unit

In previous grades students merely recognized rhombuses (rhombi), rectangles and squares, they must now (a) recognize them as quadrilaterals and (b) draw examples of quadrilaterals other than rhombus, rectangle and square. They must also use a right angle as a benchmark for drawing obtuse and acute angles and identify those in rhombi, rectangles and squares. Also, 3rd grade students build on their previous experience of partitioning shapes into equal parts but they now focus on the fact that while the parts of identical wholes are equal, they need not have the same shape. Geometric concepts in 3rd grade move to developing spatial relations by associating 3-D shapes and the nets that make up the 3-D shapes (right rectangular prism, right triangular prism, and pyramid).

Potential Instructional Strategies/Lessons

Teacher Notes:

This unit addresses the way students think and reason about shape. Students continue to develop their geometric thinking from Grades 1 and 2, progressing from a descriptive to an analytic level of thinking, where they can recognize and characterize shapes by their attributes and properties. Although the obvious emphasis in this unit is quadrilaterals, the central objective is the development and expression of geometric thought. Students will move from "naming" a shape ("A square is a square because it looks like a square.") to describing, drawing, building, comparing, and classifying shapes based on properties (attributes). Students develop "if…then" statements such as "If a quadrilateral has a right angle and all sides are equal in length, then the shape is a square." Students should be able to consider shapes within a class rather than as a single shape. Instead of talking about "this rectangle", it is possible to talk about "all rectangles." Students realize that in order to "group" shapes, they must have at least one common attribute. The general goal is to explore how shapes are alike and different and use these ideas to create classes of shapes both physically and mentally. In order to communicate their thinking, students must be comfortable with geometric descriptions of shapes. They begin to notice different size angles and how their sizes affect the shape of an object. They begin to see 3-D shapes based on their nets (2-D faces).

Activities should encourage students to explore, talk about, represent, and interact with geometric shapes. Common tools include tangrams, pattern blocks, geoboards, dot and grid paper, and construction parts (pipe cleaners, straws, commercial materials, etc.). The more students manipulate, represent, and discuss the shapes, the more relationships they discover. (Ex. two-dimensional shapes having 4 straight sides, 4 points (vertices), and 4 angles)

Since third grade does not address parallel and perpendicular, quadrilateral is defined as a closed shape with 4 sides, 4 vertices, and 4 angles.

https://www.engageny.org/resource/grade-3-mathematics-module-7-topic-b-lesson-4

Excellent activity to introduce quadrilaterals. Remember to omit the sections on parallel and perpendicular.

Creating paper models like these geometric nets allows children to explore the more familiar 2 dimensional shapes that go into making a three dimensional one.

- Cube: http://www.kidzone.ws/math/geometry/nets/cube.htm
- Right Rectangular Prism: https://www.teachervision.com/graphs-and-charts/graphic-organizers/52456.html
- Right Triangular Prism: https://www.teachervision.com/geometry/printable/6183.html
- Pyramid: http://www.korthalsaltes.com/model.php?name_en=square%20pyramids

https://www.ixl.com/math/grade-3/angles-greater-than-less-than-or-equal-to-a-right-angle
Using right angles to identify acute and obtuse angles.

Constructing a Geometric Solid Ornament (right rectangular prism (including cube), right triangular prism, pyramid)
- What you'll need: coffee stirrers, beads, pipe cleaners cut to be 1 inch longer than the stirrers
1. Choose a geometric solid. {*How many segments (edges) does your solid have? You will need that many coffee stirrers and pipe cleaners.*}
2. Place pipe cleaners inside the coffee stirrers
3. Start decorating the straws with beads.(*How about a pattern?*) (It may help to bend the pipe cleaner to keep your beads from falling off.)
4. Twist the ties at the vertices to complete the geometric ornament.

Resources

https://www.khanacademy.org/math/basic-geo/basic-geo-shapes/basic-geo-classifying-shapes/v/quadrilateral-overview
This quadrilateral overview provides background information for the teacher before beginning plans for this unit. In order to lead discussions and answer questions, the teacher needs an understanding of what a quadrilateral is and how to classify them beyond the expectations of the Standards for this grade level.

Literature Connections
If You Were a Quadrilateral by Molly Blaisdell
If you were a quadrilateral, you would have four straight sides. You could be a checkerboard, a kite, or a yoga mat. What else could you be if you were a quadrilateral?

Grandfather Tang's Story by Ann Tompert
Tompert draws on a Chinese form of storytelling with seven shapes cut from a square of paper. The tale encourages students to examine attributes of two-dimensional shapes and the tangram insets motivate children to try their own versions.

Sample Formative Assessment Tasks/Questions

https://www.engageny.org/sites/default/files/.../g4-m4-full-module.pdf

Unit 4, pages 19-31, includes a paper folding activity as the basis for concept development of right, acute and obtuse angles. Worksheets and assessments are also included.

Byron's Shapes 3.G.1 Task 1 from NCDPI

Sally's Shape Sort 3.G.1 Task 2 from NCDPI

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3rd Grade Unit 8	Return to	

Problem Solving with Measurement

Content Standards with Clarifying Notes

Open bullets indicate clarifying notes.

- 3.MDA.1   Use analog and digital clocks to determine and record time to the nearest minute, using *a.m.* and *p.m.*; measure time intervals in minutes; and solve problems involving addition and subtraction of time intervals within 60 minutes.
- 3.MDA.2   Estimate and measure liquid volumes (capacity) in customary units (i.e., c., pt., qt., gal.) and metric units (mL, L) to the nearest whole unit.
- 3.MDA.5   Understand the concept of area measurement.
    a.   Recognize area as an attribute of plane figures;
    b.   Measure area by building arrays and counting standard unit squares;
    c. Determine the area of a rectilinear polygon and relate to multiplication and addition.
- 3.MDA.6   Solve real-world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.
- 3.ATO.8   Solve two-step real-world problems using addition, subtraction, multiplication and division of whole numbers and having whole number answers. Represent these problems using equations with a letter for the unknown quantity.

New Academic Vocabulary for This Unit

- analog clock
- digital clock
- interval
- capacity
- cup
- pint
- quart
- gallon
- milliliter
- liter
- area
- perimeter
- square units

Prior Knowledge Required for This Unit

Time: In first grade students used analog and digital clocks to tell time to the nearest hour and half hour and in second grade to tell and record time to the nearest 5-minute interval, using a.m. and p.m.

Capacity: none (In first and second grades, the concentration is on length)

Area and Perimeter: First and second grade study of length supports these concepts.

Subsequent Knowledge Related to This Unit

Time: In fourth grade, students will solve real world problems involving intervals of time within 12-hour periods. In fifth grade, they will convert seconds, minutes and hours .

Capacity: In fourth grade, students will solve real world problems involving liquid volume using the four operations. They will convert mL and L in fifth grade.

Area and Perimeter: In fourth grade, students will apply the area and perimeter formulas for rectangles. They will differentiate among perimeter, area, and volume and identify which application is appropriate for a given situation.

Relationship Among Standards in This Unit

Students will apply understanding of measurement in problem solving situations.

Potential Instructional Strategies/Lessons

Teacher Notes:

Measurement is a count of how many units are needed to fill, cover, or match a given object.

Time

Time can be thought of as a point in time or as the duration of an event from beginning to end. The labels a.m. and p.m. should be used in the context of word problems.

The skill of reading a clock is similar to reading any meter that uses pointers on a numbered scale. After a review of time to the hour and five minutes, continue instruction with a one-handed clock (hour hand only). Give each student a copy of clock faces (BLM38 at http://www.ablongman.com/vandewalleseries/volume_2.html) on which you have drawn the hour hands. Include placements that are a quarter past the hour, half past, close to the hour, etc. For each clock face, the students will write the digital time and draw a minute hand on the clock where they think it would be.

Determining intervals of time within one hour should be a mental process involving multiples of five with single minutes "counted on." Avoid having students use only pencil and paper to subtract from 100. This is an effective checking strategy but is not practical in real life situations. For example, determining the interval between 2:05 and 2:52 might be counted by 5s to 50 and then 2 minutes added on (47 minutes). The interval between 3:07 and 3:45 might be counted as 3 minutes until 3:10 and then 7 fives (35) to 45. The interval is 3 + 35 = 38. Open number lines can be used to represent student thinking, using "jumps" to show the fives and ones (or other units a student might use, like 10 or 30).

Capacity

Liquid capacity refers to the amount of liquid that a container holds (how much is in it or a count of how many units it takes to fill it). As introduction to this concept, discuss the meaning of capacity. Then label 5 or 6 containers of varying shapes and sizes with A-E, etc. Ask the students to order the containers from least capacity to greatest capacity by writing the corresponding letters on a paper. Then have students discuss in groups to come up with a group answer and be able to defend the solution. After all groups have presented their solutions, measure using the same units for each (1.e., use mL for all of them.).

Understanding the units of capacity requires hands-on experiences with each unit. Place a plastic tub and an empty quart container in the room and have students estimate the number of quarts it will take to fill the container to a line. Then measure using water. Repeat with different size containers and different size units. Doing one estimate/measuring activity each day throughout the unit will provide visual and hands-on experiences.

Have students order from least to greatest: milliliter, cup, pint, liter, quart, gallon

Area and Perimeter

Conceptual development of area and perimeter is important in understanding the purpose for these measurements and to help students understand the relationships involved. From these understandings, students can develop meaningful formulas instead of memorizing a "trick" to find an answer. Through these activities, students are less likely to confuse area and perimeter.

Resources

Time

https://jr.brainpop.com/math/time/timetotheminute/
 a video to demonstrate time to the nearest 5 minute and minute
https://learnzillion.com/lesson_plans/8531-reading-the-exact-minute-on-a-clock
  a video of telling the exact time on a clock using a counting strategy
https://learnzillion.com/lesson_plans/8544-drawing-the-exact-time-on-a-clock
  drawing hands on a clock to show time to the nearest minute
https://learnzillion.com/lesson_plans/8544-drawing-the-exact-time-on-a-clock
  worksheets with problems of intervals of time within an hour
http://mrnussbaum.com/bedtime-2/
  a telling time matching game with hour, 5 minute, and minute times (3rd grade expectations with elapsed time are within a 60 minute period.)
http://mrnussbaum.com/clockworks
  setting clocks to given times

Capacity

https://educators.brainpop.com/lesson-plan/measuring-liquids-lesson-plan-cups-pints-quarts-and-gallons/

   a lesson plan with video for measuring cups, pints, quarts, and gallons

http://www.watchknowlearn.org/Video.aspx?VideoID=19665&CategoryID=2334

   a video showing comparisons and conversions of cups, pints, quarts, and gallons

http://www.australiancurriculumlessons.com.au/2013/11/29/teaching-year-34-capacity-4-lessons-will-help/

  lessons on L and mL contain excellent ideas to pull from

Area and Perimeter

Lessons from NCDPI Grade 3 Unit: Area and Perimeter

- http://maccss.ncdpi.wikispaces.net/file/view/3rdGradeUnit.pdf/559562575/3rdGradeUnit.pdf
- Lessons 1 - 8 : Developing the concept of tiling a figure to determine area as well as application to real-world situations.
- Additional lessons : Finding perimeter and area of rectilinear figures.

https://www.ixl.com/math/grade-3/area-of-squares-and-rectangles-word-problems

  practice with area of squares and rectangles

Literature Connections:

Spaghetti and Meatballs for All by Marilyn Burns

Mr. and Mrs. Comfort are having a family reunion! Mr. Comfort starts cooking up his famous spaghetti and meatballs, while Mrs. Comfort carefully arranges eight tables and thirty-two chairs so that everyone will have a seat. The tables look lovely, the food is ready, and here come the guests--with their own seating plans!

  https://www.youtube.com/watch?v=jN_GmgeU5cw

the story is read aloud on YouTube

  http://w ww.beaconlearningcenter.com/Lessons/183.htm

This lesson uses *Spaghetti and Meatballs for Al*l to explore the relationship between the area of square units and their perimeters based on various arrangements

  http://www.teachingwithamountainview.com/2013/04/perimeter-and-area.html

A teacher shares her activities using the book

Chickens on the Move (Math Matters) by Pam Pollack

Tom, Anne, and Gordon learn about shape and measurement when they try to find the right spot for their chicken pen.

See the Lesson 18: *A Pen for Pugsy* by in the unit below under "Assessments."

Sample Formative Assessment Tasks/Questions

*maccss.ncdpi.wikispaces.net/file/view/**3rdGrade**Unit.pdf*

   a unit of study including tasks and assessments to address area and perimeter

https://www.studyladder.com/games/activity/milliliters-and-liters-activity-1-26335

   interactive questions on mL and L

https://www.engageny.org/resource/grade-3-mathematics-module-2-topic-overview

   module includes lessons to explore and assess:

1. Explore time as a continuous measurement using a stopwatch.
2. Relate skip-counting by fives on the clock and telling time to a continuous measurement model, the number line.
3. Count by fives and ones on the number line as a strategy to tell time to the nearest minute on the clock.
4. Solve word problems involving time intervals within 1 hour by counting backward and forward using the number line and clock.
5. Solve word problems involving time intervals within 1 hour by adding and subtracting on the number line.

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3rd Grade Unit 9		

Fluency with Multiplication and Division

Content Standards with Clarifying Notes

Open bullets indicate clarifying notes.

- 3.NSBT.3   Multiply one-digit whole numbers by multiples of 10 in the range 10 – 90, using knowledge of place value and properties of operations.
- 3.ATO.7   Demonstrate fluency with basic multiplication and related division facts of products and dividends through 100.
- 3.ATO.8   Solve two-step real-world problems using addition, subtraction, multiplication and division of whole numbers and having whole number answers. Represent these problems using equations with a letter for the unknown quantity.
- See charts specifying Addition, Subtraction, Multiplication, and Division Word Problem Situations/Types.

New Academic Vocabulary for This Unit

- Fluency

Prior Knowledge Required for This Unit

Student work with problem solving situations began in kindergarten with modeling, writing expressions and equations, and solving addition and subtraction situations within 10. (K.ATO.1, K.ATO.2) Situations extended through 20 in first grade (1.ATO.1 and 1.ATO.2) and through 99 in second grade . Students worked with two-step problems in second grade. (2.ATO.1)

Subsequent Knowledge Related to This Unit

In fourth grade, students will multiply a whole number times a fraction (4.NSF.4). They will solve multi-step. real-world problems using the four operations (4.ATO.3). They will recognize multiples and factors (4.ATO.4).

Relationship Among Standards in This Unit

In this culminating work with multiplication and division facts, students will demonstrate fluency with multiplication and division facts, and apply these facts in problem solving situations.

Potential Instructional Strategies/Lessons

Teacher notes:

Teachers frequently note that "not knowing basic math facts" is a common and conspicuous difficulty, an impediment to higher-level math, and a corrosive influence on the self-confidence of students. Students with weak underlying math concepts require substantial help to make even the most basic practical use of math skills. Instructional support for these students requires: repeated teacher-guided work with physical objects, accurate and consistent *verbalizing* of their actions with those objects, and very explicit transfer of examples into real world applications, again with consistent and clear verbalizing from the student. All students require practice through application to demonstrate understanding of multiplication and division concepts.

Work in this unit provides a variety of opportunities to practice core facts and skills, but in a much more interesting context than this usually happens. Meaningful problem solving situations and games might include activities such as the following.
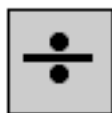
Draw a number line on a piece of paper, marked from 0 to 20 , like this:

(You could print a sheet with several number lines drawn on it.)
This challenge is a game for two players. The first player chooses two numbers in this grid and either multiplies or divides them.

He or she then marks the answer to the calculation on the number line. The second player then chooses two numbers and either × or ÷ , and marks that number in a different color on the number line. If the answer is too big or too small to be marked on the number line, the player misses a turn. The winner is the player to get three marks in a row with none of their opponent's marks in between.

https://www.ixl.com/math/grade-3/multi-step-word-problems
  interactive addition and subtraction multi-step problems
https://learnzillion.com/lesson_plans/8632-solving-two-step-word-problems-using-a-model
  strategies for solving 2-step problems
https://www.khanacademy.org/math/cc-third-grade-math/cc-3rd-mult-div-topic/cc-3rd-two-step-word-problems/v/how-many-truffle-eating-guests-attended-a-party
  strategies for solving 2-step problems
http://www.lakeshorelearning.com/general_content/free_resources/teachers_corner/lessonplan.jsp?lessonplan=multistepWordProblems
 lessons on multi-step problem solving {Click on *View the 3rd-5th Grade lesson plan (Includes all printable materials)* near the end of the information}
file:///C:/Users/Dale/AppData/Local/Microsoft/Windows/INetCache/IE/HCDWODYF/challenges_5-8.pdf
 problem solving challenges from NCTM (suggest challenges 7 and 8)

Resources

https://www.ixl.com/math/grade-3/multiplication-and-division-facts-up-to-10-true-or-false
   uses true/format to practice facts

https://www.ixl.com/math/grade-3/multiplication-tables-up-to-10
   interactive practice with multiplication facts

*maccss.ncdpi.wikispaces.net/file/view/**3rdgrade_GAMES_3.21.14.pdf***
   games to increase fluency with basic facts

Literature Connections:

Now For My Next Number! by Margaret Park
      fun, easy-to-memorize songs teach times tables--includes CD

Math Attack! by Joan Horton
      SILLY tale of a girl struggling to learn multiplication

The Rabbit Problem by Emily Gravett
      follow two rabbits thru a year as they cope with their fast expanding brood

Breakfast at Danny's Diner by Judith Stamper
      an early reader about multiplication in the All Aboard Math series

Multiplying Menace by Pam Calvert
      a boy can save his kingdom if he can get a hold of Rumpelstiltskin's secret multiplying wand

Multiplying Menace Divides by Pam Calvert
      a prince must stop Rumpelstiltskin from dividing the kingdom into frogs

Cheetah Math by Ann Whitehead Nagda
      learning about division from baby cheetahs

One Hungry Cat by Joanne Rocklin
   a baking cat makes, eats, and divides up cookies for his friends

Bean Thirteen by Matthew McElligott
   two insect buddies collect 13 beans for a dinner with their friends but can't seem to divide it up evenly

Sample Formative Assessment Tasks/Questions

https://www.teacherspayteachers.com/Product/3rd-Grade-2-Step-Word-Problems-MCC3OA8-670082
   free assessment on 3.ATO.8

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